

Running Head: HAZARD SPECIFIC EMERGENCY OPERATIONS PLAN

Developing a Hazard-Specific Emergency
Operations Plan for the Northwest Fire District

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Abstract

The Northwest Fire District (NWFD) has a major railway system carrying cargo including hazardous materials through its jurisdiction. The NWFD has a basic Emergency Operations Plan (EOP) established in 2007. The problem was that the EOP did not address how to respond to a hazard-specific railway incident. The purpose of this research was to identify the criteria and standards needed for a hazard-specific incident Emergency Operations Plan that addresses an incident along the railway within Northwest Fire District.

A descriptive research process was conducted to analyze what national and state standards, regulations, and other criteria are used to develop emergency operations plans. Research was also conducted to study how other fire service agencies developed EOP's. A commodities list was obtained from officials from the Union Pacific Railroad. Members of the Northwest Fire district's Special Operations Team were interviewed to establish their concerns.

Research was examined through a literature review of NFPA, FEMA, and OSHA standards and regulations to determine what criteria would be applicable to an emergency operations plan. Results of feedback from other fire service agencies included components that could be used in plan development. Research gathered from the commodity list identified what specific

hazards are transported. From the research obtained through feedback from the NWFD Special Operations Team a hazard specific plan is recommended based on the cargo shipped through the district.

Recommendations also include a systematic training process to ensure the community is prepared for a major railway incident. It also recommends pre-planning and possibly mitigating situations that may lead to an accident. Research gathered through literature review and questionnaires provided a basis for developing a specific plan that assist the Northwest Fire District prepare, mitigate, respond and recover from a railway emergency in a safe and efficient manner.

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The Northwest Fire District (NWFD) is located northwest of Tucson, Arizona. The district covers an area of Tucson, as well as, Marana, Arizona to the north. The Union Pacific Railroad has a major transcontinental railway that passes through the fire district (Union Pacific Railroad, 2009). The railroad transports a diverse cargo including hazardous materials on this railway across the southwest portion of the United States.

The Northwest Fire District has an Emergency Operations Plan (EOP) that is comprehensive, simple, and flexible (Northwest Fire District, 2007). The problem is that the Northwest Fire District EOP does not address how to respond to an incident within their jurisdiction involving specific hazards. Without a hazard-specific EOP, the life safety of responders and citizens are at risk. The purpose of this research is to identify the criteria and standards required for a hazard specific incident Emergency Operations Plan that addresses a major railway incident occurring within Northwest Fire District response area.

In the preparation for research into the problem and purpose statements, the following research questions were developed: (a) what are the national standards or criteria used in a hazard specific railway emergency operating plan?(b) what

are the state or regional standards or criteria used in a hazard specific railway emergency operating plan? (c) what are the criteria or standards used by other emergency services organizations with similar demographics to the Northwest Fire District using for a hazard specific railway emergency operating plan? (d) what are the standards and criteria that the Northwest Fire District should include in its hazard specific railway emergency operating plan?

The applied research will be descriptive. Questions "a" and "b" will be answered through the literature review process of reviewing national and Arizona standards and statutes enacted to assist the fire service in developing emergency operations plans. Question "c" will be answered by collecting data and information from experts and fire service agencies similar to the Northwest Fire District with experience in managing railway incidents involving hazardous materials. Question "d" will be answered through interviews with members of the NWFD Special Operations Team. These individuals will provide local data and information that will assist in formulating an Emergency Operations Plan at a later date. It is anticipated that special hazards will be identified. Once the research is completed, a method can be developed to create an emergency operation plan that will address a specific hazard carried on a railcar. The

hazard specific can then be applied to the original NWFD Emergency Operations Plan.

Background and Significance

The Northwest Fire District (NWFD) covers approximately 140 square miles of the unincorporated area northwest of Tucson, Arizona (Northwest Fire District, 2006). This area also includes the Town of Marana, Arizona which is also northwest of Tucson along U.S. Interstate 10 (Appendix A). The district was established in 1984 and now serves approximately 110,000 residents of this area. The fire district operates under Arizona Revised State Statute (ARS) Title 48 (Arizona Revised Statutes, 2008). This statute allows a special taxing district to levy a specific property tax on the residents of an identified district for the purpose of providing fire protection.

The NWFD is governed by a five-person, publically elected Fire Board that develops the policy of the district. The operations and management of the NWFD is directed by the Fire Chief. The NWFD is administered by a staff of fire service and civilian professionals. The senior management staff consists of the Fire Chief, Assistant Chief of Operations, Community Services, and Logistics. The senior leadership staff also includes Division Chiefs of Operations, Training, Life Safety Services, Special Projects, and Fleet Services. Because of its special taxing purposes, the district maintains its own Human

Resources, Finance, and Administrative Services. The NWFD also provides a Community Assistance Team and a Public Information office. These positions are staffed by civilians (Appendix B). The Northwest Fire District currently staffs nine fire stations with approximately 205 fire suppression personnel.

The Union Pacific Railroad operates a freight railway that travels through the fire district. The railroad carries cargo from the seaports of San Diego and Long Beach, California to El Paso, Texas (Appendix C). From there the cargo can be transported to anywhere in the country. The Union Pacific Railroad carries a large amount of chemicals as part of their transportation services. These chemicals include Fertilizer, Liquid/Dry Chemicals, LPG, Petroleum product, Plastics, Phosphorous rock, Soda Ash, and Sulphur (Union Pacific Railroad, 2009). As part of their Emergency Management program the Northwest Fire District completed an Emergency Operations Plan in 2007 to create a method of handling major emergencies in the fire district (Northwest Fire District, 2007). The plan was written in accordance to Arizona Revised Statutes (ARS) Title 26, Chapter 2; Article 1. Under this law the fire district is responsible to prepare and respond to emergencies and disasters in order to save lives and protect public health and property (Arizona State Legislature, 2009).

By nature, this plan was a generic approach to handling a major emergency. The Northwest Fire District's Emergency Operations Plan addresses the consequences of any emergency and/or disaster in which there is a need for District response and recovery assistance. It is applicable to disasters such as fires, emergency medical incidents, earthquakes, and floods, technological emergencies involving hazardous material releases, and acts of terrorism. The plan groups types of assistance in Emergency Support Functions (ESF). These ESF's are activated depending on the type of emergency.

Because of the extensive railroad traffic through the fire district, an emergency operations plan needs to be developed that addresses specific hazards carried on the railroad. The Northwest Fire District document in general does not establish this. The intention of this study is to investigate and describe the components required to develop a hazard specific emergency operations plan. National, State, and local standards illustrate what is required to create an effective plan. Data secured from other fire service agencies that manage extensive railroad traffic will also be analyzed. Using the knowledge of the NWFD personnel specially trained in hazardous materials response and the expertise of the Union Pacific Railroad, the components of a hazard specific emergency operations plan can be suggested.

This study is directly linked to the Executive Fire Officer

Program's third year curriculum, *Executive Analysis of Fire Service Operations in Emergency Management*. It also applies directly to the National Fire Administration's mission and goals two (2) and three (3) of reducing risk at the local level through improving the local planning and preparedness and improving the NWFD's response capabilities to all hazards (United States Fire Administration, 2009). The results of this study will enable managers of the NWFD Special Operations Division to develop a hazard specific emergency operations plan for railway traffic accidents through the fire district. It will also allow them to develop training exercises and drills for members and their surrounding mutual aid partners. The plan will provide a systematic approach to managing and handling a major hazardous materials incident. It will also provide a safe approach to protecting the members of the NWFD community as well as better protect emergency responders.

Literature Review

Review of National criteria

The literature review examines published subject matter pertaining to the study of creating an effective emergency operations plan (EOP). The review gives the researcher guidance in how to develop the components of the EOP. The National Fire Protection Association (NFPA) develops consensus standards for fire service agencies to follow in preparing for major

emergencies and disasters. NFPA 1600, *Standard on Disaster/Emergency Management and Business Continuity Programs*, establishes a set of criteria for disaster and emergency management programs for communities and the fire service to follow (National Fire Protection Association, 2007). The standard provides guidance on providing programs that assist in five components of effective emergency management. These components are prevention, mitigation, preparation, response, and recovery. NFPA 1620, *Recommended Practice for Pre-incident Planning; 2003 Edition* is a national standard that provides guidance in developing a planning process of preparing for major emergencies and disasters (National Fire Protection Association, 2003). Pre-incident planning can be developed to assist first responders by accessing information about their target hazards and the area surrounding the hazards. NFPA 1561, *Standard on Emergency Services Incident Management System 2008 Edition* is a standard that emergency personnel can follow to develop an incident management system to manage resources responding to emergency and disaster incidents (National Fire Protection Association, 2008). NFPA 472, *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents*, set minimum levels of competence for emergency responders who respond and handle hazardous material incidents to follow (National Fire Protection Association, 2008). These

NFPA standards serve as a starting point for research into plan development.

Another important resource to use in developing an emergency operations plan is the *Guide for All-hazard Emergency Operations Planning; SLG-101* (Federal Emergency Management Agency, 1996). This document is produced by the Federal Emergency Management Agency (FEMA). The guide gives local managers an established method of developing an effective EOP. The Northwest Fire District followed this guideline when developing their basic EOP in 2007. The *SLG 101* suggests that local agencies develop a hazard analysis to identify potential hazards in their community. The NWFD identified railway hazards as a top priority during their risk analysis procedure when developing their Standards of Response document for National Accreditation in 2006 (Northwest Fire District, 2006). Another FEMA document, *Producing Emergency Plans, CPG 101*, is another planning tool developed to assist state and local governments in emergency operations planning (Federal Emergency Management Agency, 2008). This document is considered a sequel to the *SLG 101*. The newer version (CPG 101) integrates the concepts of the National Incident Management System (NIMS) and the National Response Framework (NRF). The NRF is a planning document on how to respond to any type of hazard incident. The document is

similar to NIMS in that it standardizes response criteria to all personnel (Federal Emergency Management Agency, 2008).

While NFPA standards and the SLG 101 are considered guidelines to the fire service and emergency managers for formulating emergency operations plans, the Federal Occupational Safety and Health Association (OSHA) establishes laws and regulations that must be followed by responders and agencies handling hazardous materials. The Code of Federal Regulations (CFR) Title 29, Standard 1910.120 is the major federal regulation addressing hazardous waste operations and emergency response (HAZWOPER) (Code of Federal Regulations, 2004). This regulation is the enforcement component that mandates the proper methods of handling hazardous materials. The law mandates proper training and qualifications of personnel, a systematic approach to managing incidents, and the proper cleanup of hazardous materials if an accident occurs (Occupational Safety and Health Administration, 2006). Section 1910.38 of the regulations states that an employer must have an emergency operations plan developed on their site that is specific to the hazard they carry. In the case of the Northwest Fire District, a generic emergency operations plan was developed in 2007 to address the overall approach to major emergencies. Another important feature of the CFR 29.1910 is the procedures required for handling emergency response to hazardous materials incidents. A site-

specific Incident Command System must be established (Occupational Safety and Health Association, 2006). This regulation mandates an Incident Commander be established along with the necessary resource management components for the incident including a safety officer.

On February 28, 2003, the office of the President issued *Homeland Security Presidential Directive 5*. The major policy is designed "to prevent, prepare for, respond to, and recover from terrorist attacks, major disasters, and other emergencies" (Homeland Security Presidential Directive/HSPD5, 2003). An objective of the directive is to ensure that all levels of government work together to manage major incidents. This directive created the National Incident Management System (NIMS). The system provides a standardized national approach to managing major incidents. The system is designed to be implemented at any level of response from local to federal. It incorporates a consistent command system that provides an efficient and safe approach to incidents. The system also sets criteria for inter-agency and inter-jurisdictional operability.

State information

In conjunction with national standards and regulations, the State of Arizona enacts their own set of regulations. The State of Arizona, under an agreement with OSHA, operates an occupational safety and health program in accordance with

Section 18 of the Occupational Safety and Health Act of 1970. According to their website, the Arizona State Plan is administered by the Industrial Commission of Arizona (ICA) and within the ICA, the Arizona Division of Occupational Safety, and Health (ADOSH) is responsible for enforcement and voluntary compliance (United States Department of Labor, 2009). As part of their state plan, Arizona defers to the Federal CFR Title 29.1910 regulations on managing and handling hazardous materials incidents.

Under the Arizona Revised Statutes (ARS) 26-311, a local municipality or district is empowered to declare emergencies in their communities from either environmental or technological nature (Arizona State Legislature, 2009). Community leaders are allowed to use the necessary measures to combat their emergency. The Northwest Fire District's current Emergency Operations Plan establishes a basic approach to managing a major emergency in the community. Following the National Response Plan format, the district plan established thirteen (13) Emergency Support Functions (ESF's) (Northwest Fire District, 2007).

The Union Pacific Railroad operates a major freight line through the NWFD and the city of Tucson. The railway is a major thoroughfare of freight traffic between the seaport of Long Beach, California and Houston, Texas. The Long Beach seaport is the second largest seaport in the United States. More than \$100

billion of cargo moves through the port (About the port, 2009). The seaport of Houston is ranked first in receiving foreign cargo. More than 225 tons of cargo passed through the port in 2007 (Port of Houston Authority, 2009). The Union Pacific Railroad serves a major link to moving cargo back and forth between these two major shipping hubs. The use of railroads to transport chemicals is cost efficient and the safest method of operation. According to the Association of American Railroads, in 2006, 99.996 percent of the 1.7 to 1.8 million carloads of hazardous materials reached their destination without a release caused by a railway accident (Association of American Railroads, 2009). Despite their impressive safety record, one railway incident can create catastrophic consequences to a community or fire district.

The literature review displays several resources from the national, state, and local level to properly develop an effective Emergency Operations Plan that can manage a specific hazard incident with the Northwest Fire District. The NWFD basic EOP already established is a good start to developing several annexes dealing with specific emergencies. All emergency support functions are identified. The literature review has identified that regulations must be followed in order to avoid the attention of an OSHA violation. Unlike NFPA or SLG 101 resources, OSHA regulations must be followed in order to avoid

prosecution or financial penalties. In October 2007, the neighboring fire district of the NWFD, Avra Valley, Arizona was fined by the Industrial Commission of Arizona \$366,000 for workplace violations. A majority of the fine dealt with a hazardous materials incident the district responded to in March 2007 (Gillum, 2007). One of their violations was not developing an emergency operations plan to handle anticipated hazardous materials incidents. Other resources, such as the NFPA Standards and especially the *Guide for All-hazard Emergency Operations Planning; SLG-101*, are effective templates for developers to follow. Using these guidelines, a site specific plan can be designed.

The next step in the developmental process is to research the railway system to determine the types of hazardous materials transported through the fire district. Once established, a specific hazard plan can be developed. Part of the research will also be to examine what other fire service agencies that are similar to the NWFD to see how their emergency operations plans are developed.

Procedures

The methods to answer each of the four research questions were applied through the use of literature review and research studies. The review of existing regulations and industry standards gives the researcher the insight of why sound

emergency operation planning is needed by a fire district or community. The research of existing emergency operation plans demonstrates how others are managing emergency operations. Structured interviews with industry experts show detailed information about the specific hazards that will affect the Northwest Fire District should an accident occur. The four established research questions serve as a guide to the research process. Using the questions, research data is analyzed and applied. The research strategy is to start the investigation at the national level to review regulations and standards, work down to the state and regional level, and then refine the research to fire districts and communities with existing plans. On the local level, more specific information will be gathered from experts who understand and work in the current Arizona system. These experts will include hazardous materials specialists and railroad personnel.

Methodology

While attending the National Fire Academy in January 2009, basic research was conducted at the Learning Resource Center (LRC) on campus. With no specific topic in mind other than planning for emergency operations, basic information was analyzed and saved for future use. This was completed by using the LRC's electronic search service. Research conducted from home included electronic searches through the LRC, the Google

search engine, and the electronic library resource at Grand Canyon University's web-site.

Research for national standards and criteria was obtained by first reviewing any regulations and laws specifically pertaining to hazard specific railway incidents. Regulations developed through the Federal Occupational Safety and Health Administration (OSHA) establishes procedures for hazardous materials incidents. Also the National Fire Protection Association (NFPA) establishes industry standards for the fire service to follow. The Federal Emergency Management Agency (FEMA) working under the Department of Homeland Security publishes a comprehensive planning guide for emergency managers to follow in creating an emergency operations plan. The Comprehensive Preparedness Guide (CPG 101) provides the methodology for planners of both a basic guide and a hazard-specific guide to an incident in their community (Federal Emergency Management Agency, 2008). This guide incorporates the principles of the National Incident Management System (NIMS) and also the National Response Framework (NFR) (Federal Emergency Management Agency, 2008).

The research of state and regional criteria includes the review of the Arizona Revised Statutes (ARS). These regulations will provide the understanding as to why emergency planning is needed for specific locations throughout the state. Coupling

with federal regulations, the research will provide the reason fire service agencies need to protect their communities and their emergency responders to hazardous materials incidents.

To investigate what other fire service agencies are using for managing major emergencies, a questionnaire (Appendix D) was developed asking the third research question:

"What are the criteria or standards used by other emergency services organizations with similar demographics to the Northwest Fire District for a hazard specific railway emergency operation plan?"

The document also asked the following questions:

1. Do you have a railroad running through your response area?
2. Do you have a hazard specific railway emergency operations plan?
3. Would you send me a copy please?

The document was sent to Executive Fire Officer students via electronic mail using a mailing list supported by a fellow student. The questionnaire was also sent to the web administrator of the National Society of Executive Fire Officers (National Society of Executive Fire Officers) who provides a service for EFO students of posting questionnaires and ARP survey instruments.

To research what would be the best options for the Northwest Fire District's plan of response to hazard specific railway incidents, a review of returned EOP's from the survey instrument will be conducted. The review should indicate similar actions that the NWFD could provide in their EOP. Research interviews will be conducted with members of the NWFD Special Operations Division. These members include the Captains of Fire Stations 333 and 334 who serve as the Hazardous Materials Response Unit for the Northwest Fire District and the surrounding area.

There should be some sort of assumptions made based of the type of hazards described through interviews with railroad officials. Statistics of their cargo inventory will indicate the type of hazards transported to and from the seaports of Long Beach and Houston. The interviews conducted with members of the NWFD Special Operation division should indicate what they feel is important to include in the hazard specific EOP. Based on review of the FEMA CPG 101 document it is clear that an evacuation plan will need to be developed along the vulnerable points of the railroad (Federal Emergency Management Agency, 2008). Because of the possible need for evacuation, a review of the district's population and demographic concentration will need to be analyzed. This may occur through interviews with Special Operations personnel.

There may be limitations that occur with gathering the necessary information particularly with analyzing EOP's from other fire service agencies. Electronic mail addresses to EFO students may not be accurate. Responders may not send EOP's back to the researcher. The EOP's received may not be applicable to the local research problem. It is expected that enough information may be obtained from examining the federal and state regulations as well as the CPG 101 document so that an effective emergency operations plan may be developed. Also sufficient information should be obtained from local experts both from the fire service and railroad agencies to provide enough data to develop an effective plan.

Results

The results of both the literature review and the descriptive research process assist in answering the four research questions developed at the beginning of the applied research. The study and review of several federal documents, regulations, and industry standards help clarify the criteria and the information needed to create an effective emergency operations plan for the Northwest Fire District. Combining that information with Arizona Revised Statutes continues to assist with formulating the EOP. Using a structured questionnaire delivered through an electronic feedback instrument to existing and graduate Executive Fire Officers assisted in reviewing

completed hazard specific railway emergency operations plans. Finally, an analysis conducted at the local level using the assistance of the Northwest Fire District's Special Operations team and members of the Union Pacific Hazardous Materials Response Team provides the information needed to recommend the criteria for an EOP that serves the needs of the Northwest Fire District.

National Standards

The Federal Emergency Management Agency is the primary federal component for managing responses to major emergencies. The agency has developed several tools to assist the local responders. The agency introduced the State and Local Guide to All Hazards Emergency Operations Planning (SLG 101) in 1996. This document was designed to create a partnership with federal, state, and local governments to develop safe and effective approaches to emergency management (Federal Emergency Management Agency, 1996). In 2008, FEMA developed the Comprehensive Planning Guide (CPG 101) (Federal Emergency Management Agency, 2008). This document is a revision of SLG 101. It serves as one of the primary planning standards for emergency responders to use when developing an emergency operations plan for their community. The document integrates principles from the National Incident Management System (NIMS) and the National Response Framework (NRF) (Federal Emergency Management Agency, 2008) to

allow the local planner basic components for plan development. Another important federal document that plan developers need to consider is the Robert T Stafford Disaster Relief and Emergency Assistance Act (Stafford Act). This act provides the means for federal reimbursement for damages caused by local disasters. However, the regulations of this act need to be followed carefully. Proper local planning is one of the requirements of the act. The CPG 101 includes a definitive list of procedures for local planners to follow including sample planning guides. These samples include a NIMS integration assessment, hazard profile guides, and organizational responsibility (Federal Emergency Management Agency, 2008). The NIMS assessment provides assurance that the community receives the proper training in how major incidents should be managed. The training gives the community an idea on what to expect from federal, state, and regional resources. The training includes several courses from IS800, basic NIMS training to IS1, the role of the Emergency Manager. The National Response Framework provides the federal guidance for assigning responsibilities to local planners. The framework uses the organization of Emergency Support Functions (ESF) to assign responsibility for local operations (Federal Emergency Management Agency, 2008). The four documents, the CPG 101, the NIMS, the Stafford Act, and the NRF provide the basic framework for local planner to begin their planning process.

National standards and criteria also include federal regulations developed through the Occupational Safety and Health Agency (OSHA). OSHA regulation 29 CFR 1910.120, titled Hazardous Waste Operations and Emergency Response (HAZWOPER) is a mandate to agencies responding to and handling hazardous materials incidents. This regulation mandates the establishment of an incident command system as described in the NIMS document (Occupational Safety and Health Administration, 2006). The mandate also identifies the need for training of responders, an emergency operations plan, and a risk identification and analysis of the specific hazard. Failure to follow OSHA regulations during a response to a hazardous materials incident may result in violations and expose the community or responding agency to monetary fines. A violation was cited in the Literature Review (Gillum, 2007).

The National Fire Protection Association (NFPA) is considered the benchmark organization for the fire service. The NFPA establishes standards for the fire service to follow in developing their protocols and methods for service. These standards are developed as the "best business practices" by committees of fire service and industry professionals. These "consensus standards" do not carry the weight of a regulation or labor law, but fire service professionals use these standards as guides to their operations. In response to hazardous materials

incidents, one of the standards that should be included in an emergency operation plan development is *NFPA 472, Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents, 2008 Edition*. Section 1.2.1 of this standard indicates the "purpose of this standard shall be to specify minimum competencies required for those who respond to hazardous materials/WMD [Weapons of Mass Destruction] incidents and necessary for a risk-based response to these incidents" (National Fire Protection Association, 2008). The standard identifies the training requirements for various levels of emergency responders. Compliance with this standard and others to be identified will lower the risk and exposure of fire service agencies to litigation and injury.

Another NFPA standard that should be referenced into an emergency operations plan is *NFPA 704, Standard System for the Identification of the Hazards of Materials for Emergency Response, 2007 Edition*. The purpose of this standard is to "provide a simple, readily recognized, and easily understood system of markings that provides a general idea of the hazards of a material and the severity of these hazards as they relate to emergency response" (National Fire Protection Association, 2006). This standard allows the responder and the civilian to readily identify and plan for emergency control operations. The marking system allows for a basic identification process that

assists first responders in initial operations. Another NFPA standard identified through research for assisting with plan development is NFPA 1561, *Standard on Emergency Services Incident Management System, 2008 Edition* (National Fire Protection Association, 2008). This standard is appropriate for emergency responders and is in compliant with the National Incident Management System taught to all responders and community leaders. OSHA regulations also mandate that responders at hazardous materials incidents establish an incident management system to ensure the proper management of the operation. Another NFPA standard that will assist planner in developing their EOP is NFPA 1600; *Standard on Disaster/Emergency Management and Business Continuity Programs; 2007 Edition*. The purpose of this standard is to "establish a common set of criteria for disaster/emergency management" (National Fire Protection Association, 2007). This standard provides programs so that the community and businesses can continue to operate and recover from a hazard specific incident. It is important for the emergency planner to consider a plan that will provide for the safety of the responders and the community members involved in the incident. It is also important to create a plan that protects the community from litigation that may develop from the event. A plan should be developed also to ensure that the community or agency is reimbursed from the

federal government if applicable. The use of the Community Planning Guide (CPG 101) will ensure a proper emergency operations plan is developed with these objectives in mind. National Fire Protection Association standards will provide guidance for the fire service to follow during plan development. Occupational Safety and Health (OSHA) regulations protect responders and mandate that employers follow the laws enacted by the agency for hazardous materials incidents. These federal components provide an effective framework to begin to create an emergency operations plan for the Northwest Fire District and the Tucson community to follow.

State or Regional Standards

The State of Arizona provides guidance and regulations that basically mirror federal criteria. The Arizona Revised Statutes (ARS) recognize the need for effective emergency planning and operations by granting power to local officials to operate under certain conditions by declaring a public emergency through ARS 26-311 (Arizona State Legislature, 2009). Also, Arizona Revised Statutes contain language establishing local emergency planning committees (LEPC). The statute, Title 26; Section 344, mandates that communities and districts establish this committee to plan for major emergencies (Keyt, R, 2009). It also provides regulation for plan development (ARS 26-345), identifying hazards in the community (ARS 26-347), and the establishment of

emergency support functions as outlined in the National Response Framework (Federal Emergency Management Agency, 2008). The state of Arizona by Executive Order 2003-21 produced the *Fire Service Mutual Aid Plan* that applies to emergency responses to all types of incidents (State of Arizona fire service mutual aid plan, 2003). The order directs all state agencies to comply and contribute to the plan. Fire service agencies are encouraged to adopt and use the plan. The contents of the plan include authorities, mutual aid regions, policies, and assumptions. The plan splits the state into regions and is managed by regional coordinators. The plan has a hazardous materials section for planners to use as well as incident commanders to follow.

Standards used by other emergency services organizations

Combining the use of federal and state regulations and guidelines, the emergency planners can begin to formulate an effective plan. The next step is to analyze what fire service agencies similar to the Northwest Fire District have developed as emergency operations plans for hazard specific railway incidents. The preceding information about emergency operations planning was developed through the literature review of existing regulations and standards. Research was performed to examine existing fire service agencies that had railroad traffic carrying hazardous materials travel through their response areas. The research was also designed to gather and examine any

existing EOP's developed by fire service agencies. An electronic questionnaire was developed using the Microsoft Word application (Appendix D). Three questions were asked:

1. Do you have a railroad running through your response area?
2. Do you have a hazard specific railway emergency operations plan?
3. Would you send me a copy please?

Using an email address list containing 722 addresses obtained from another EFO student, 22 responses (3%) were returned. This address list proved to be unreliable because a large amount of messages were returned undeliverable. Another address source was used from the National Society of Executive Fire Officers (National Society of Executive Fire Officers, 2009). The organization provides a service to EFO students by either posting their questionnaire on their website or directly emailing it to a member. In the case of this research, the questionnaire was directly emailed to 667 addresses. This request prompted 16 (2%) responses. The sources of the responses were separated to analyze the reliability of the address lists. Results were posted to a Microsoft Excel spreadsheet. Responses received from the anonymous database were indicated on the spreadsheet with a "1". Responses from the NSEFO database were marked with a "2". The raw data posted on the spreadsheet was analyzed using MSEExcel's pivot table feature. Each question was

analyzed in this method with the results transferred to a summary sheet. The results are listed below:

Table 1

Research Question Analysis

Research question	Yes	No
Do you have a railroad running through your response area?	31	7
Do you have a hazard specific railway emergency operations plan?	10	28
Would you send me a copy please?	9	

The primary purpose of the questionnaire was to obtain emergency operations plans from other fire service agencies. These plans would be reviewed by the researcher to obtain key components to include in an effective operations plan for the Northwest Fire District. The nine plans collected have useful information that will assist in answering the next research question.

Standards and criteria that the Northwest Fire District should include

There were nine Emergency Operations Plans received from various fire service agencies. Components of these plans can be incorporated into the Northwest Fire plan. For example, The Tualatin Valley Fire and Rescue, Oregon protocols list definitions that are appropriate to hazardous materials

responders (Tualatin Valley Fire and Rescue, 2007). This information is very important to the plan because not all responders may understand fire service terms. The protocol also includes a detailed tactical response list for the Incident Commander to follow (Tualatin Valley Fire and Rescue, 2007, p. 2). Another important component discovered in the research is an agreement established prior to any type of response by the Tualatin Fire agency detailing their scope of operation. The language of this agreement includes that "the responsibility of Tualatin Valley Fire & Rescue is limited to emergency containment and control of the incident and to reporting and documenting activities that arise from the incident which threaten life, property, or the environment" (Tualatin Valley Fire and Rescue, 2007, p. 12). San Diego County, California operates a regional response plan that details any major event that may occur in their response range including railway incidents. Their hazard specific plan details the schematic drawings of the type of locomotive that may be involved as well as fire and hazardous materials control procedures (San Diego County Operations Area, 2005).

Representatives from the Union Pacific Railroad were contacted to request a commodities list of hazardous materials transported through the Northwest Fire District by railway. Their representatives responded with a security sensitive list

that was password protected. The contents of the cargo especially hazardous materials is protected under the Sensitive Security Information Office and controlled under 49CFR, part 15 (Code of Federal Regulations, 2004). This information needed to be approved by the Union Pacific Railroad to publish in this research. Permission was requested to include the commodities list in the research analysis and denied (Eultgen, K, 2009). The information can only be used to develop an emergency plan that helps responders operating at a hazard specific incident. The specific commodities can only be used to plan an emergency operations response. The Orange County, California Fire Authority details information about the Union Pacific Railroad's security force. Under direction from the Department of Homeland Security, a fully staffed railroad police force is available for assistance. The police unit can be utilized as a communications link to the railroad personnel for additional information. According to Orange County EOP, the railroads also maintain Action Teams similar to the fire service's Incident Management Team who are prepared to respond with specialized resources to major incidents (Orange County Fire Authority, 2009). The City of Tulare, California establishes in their EOP a planning matrix based on the Incident Management System's major functions. Based on the emergency, the Command, Operations, Logistics, Planning, and Finance components are established and the critical tasks

associated with emergency are designated. Each agency participating in the plan is inserted into the matrix (City of Tulare, California, 2005, p. 17). Tulare's plan also includes checklists for the incident commander to use for each type of major incident including train accidents (City of Tulare, California, 2005, p. 106).

The final component to analyze the standards and criteria that the Northwest Fire District should recognize is to ask experts in the field of hazardous materials and who are familiar with the operations of the NWFD. Members of the Northwest Fire District Special Operations Team were asked a series of questions.

1. Based on the commodities list presented by the Union Pacific Railroad, what are your chief concerns?
2. What can the NWFD Special Operations team do to prepare for an accident involving these commodities?
3. What would you consider important components of a hazard specific emergency operations plan involving the commodities presented?

These questions were presented to the six Captains that manage the two fire companies responsible for Special Operations (Engines 333 and 334). The interviews were conducted on the week of June 22, 2009. Captain Tony Franz stated that his chief concerns as a Hazardous Materials officer was the

characteristics of the chemicals involved. Chemicals such as chlorine and anhydrous ammonia are lighter than air. They will produce an inhalation hazard to the population in the immediate area of the release (Franz, 2009). Captain Franz is a certified Hazardous Materials Technician with a specialty in railroad incidents. He holds a Bachelors Degree in Health and Safety. His concerns stem from the technical components of the transported product. Captain Jeremiah Webb also stated in his interview the threat to the community by airborne hazards is a primary concern (Webb, 2009). Captain Leigh Foss's concerns are rooted in the basic responder's role in a railway accident incident. Her concerns are basic Haz-Mat responder concerns such as stabilizing the area and identifying the product (Foss, 2009). The second question asked how the Special Operations Team would prepare for a potential railway incident. Captain Ian Cassidy said that their members would study the commodities list supplied by the Union Pacific Railroad and enter that data into their Computer-Aided Management of Emergency Operations (CAMEO) software application (Cassidy, 2009). CAMEO includes an extensive database of chemicals. The database includes such information as characteristics, response guides, recommended personal protection, and decontamination processes (Computer-Aided Management of Emergency Management, 2009). This process would allow them to conduct research prior to the incident and

develop an emergency action plan. Evacuation, response, and egress routes would also be developed through CAMEO application. All Captains concluded that training would be their primary preparation issue. Their training would focus on the identified chemicals being transported through the district. Regional training exercises with Union Pacific personnel would include table-top drills and hands-on simulations. Pre-incident planning would be conducted on sites within the NWFD that receive chemicals via the railroad. Chemical plumes would be plotted through the ALOHA and MARPLOT component of CAMEO (Computer-Aided Management of Emergency Management, 2009). Pre-planning would also allow the team to develop explosion zones to assist in protecting the neighborhood. Special team members would like to create a railroad training prop in order to simulate various accidents. Members of the team also concluded that a hazard specific emergency operations plan should include such components as an evacuation plan for populated areas along the railway. Also, specific points of contacts, especially with the Union Pacific Railroad must be established. Captain Webb wants to include any reportable quantities chemical spilled required by the state or federal government agencies (Webb, 2009). Captain Foss wants consideration of water courses and water supplies included in the EOP (Foss, 2009).

Conclusion

Using National, State, regional and local information and standards, the planning process can begin. Ensuring that proper NFPA standards and qualifications are met and recognizing OSHA regulations a basic emergency operation plan will begin to form. Using components from various other fire service agencies a railway incident plan will further refine the planning process. Writing the hazardous materials response using the commodities list of transported products will create the hazard specific plan. The information gathered from interviews with Special Operations members will allow them direct access to the planning process. The team should have a definite role in the planning process. By being intimate with plan development they will be able to train their team to specific hazard related accidents occurring along the railroad. Developed regulations must be included to protect the fire district from legal exposure. Coupled with industry best practices ensure a safe and systematic approach to plan development.

Discussion

The literature review and study results give a clear indication into how a hazard specific emergency operations plan needs to be developed. Results obtained through the research questions establish to the student how the process can be accomplished. A majority of the work needed to be done is

already developed by the Federal government through several documents published by FEMA such as the *Developing and Maintaining State, Territorial, Tribal, and Local Government Emergency Plans; CPG 101* (Federal Emergency Management Agency, 2008). Following OSHA regulations will also serve as a guideline to protect the fire district from exposure. Using the "best practices" of NFPA standards will ensure that responders and the community are prepared.

Relationship of study results

The use of the FEMA CPG 101 guide is the primary step in effective planning for the district. This document creates a "punch-list" for the planner to follow. The Northwest Fire District already has an all-hazards emergency operations plan (Northwest Fire District, 2007). This document will also become the basis for a more specific hazard railway emergency plan. All major components can be forwarded to the railway plan. It is also important to realize the regulations established by OSHA that serve to protect emergency responders. Any plan developed needs to clearly establish responder and public safety as the primary strategic objective. Adherence to OSHA regulations also protects the fire district from violations, lawsuits, and financial penalties (Gillum, 2007). Much of the state documents are closely associated to the federal guidelines. The use of the Arizona Mutual Aid System document would also be incorporated

into the plan (State of Arizona fire service mutual aid plan, 2003). Study results from fire service agencies indicate that some agencies pay close attention to railway incidents in their communities. Some agencies have very detailed plans to address accidents along the railroad. The Tualatin Valley Fire and Rescue District in Oregon developed a very extensive emergency operations plan for their community (Tualatin Valley Fire and Rescue, 2007). This plan and others have excellent components that can be used for the NWFD plan. The plans illustrate that many strategies may be deployed regardless of the emergency. The component of an evacuation plan is an example of this. This component can be pre-planned for execution. Other agencies studied rely on their knowledge and skills in hazardous materials response to manage an accident. The concern of the researcher with this approach is that not enough community planning is involved. The results may include a fractured approach to a major incident when multiple agencies and jurisdictions respond. Study results indicate that a railway accident will encompass a large part of the NWFD community and require many agencies to respond.

The study results from members of the NWFD Special Operations team were very valuable. The leadership of this team is very knowledgeable in hazardous materials response. They will be a vital component in plan development. Members are very

accomplished in the use of technology such as CAMEO, ALOHA, and MARPLOT computer applications. These applications will provide a component for pre-incident planning.

Interpretation of study results

The interpretation of the study results indicates a wealth of information and local knowledge is readily available to develop a hazard specific emergency operations plan for the Northwest Fire District. Between the Federal and State government's guidelines and regulations an effective plan can be developed. Components of data and literature obtained from other fire service agencies can be used in the development of the plan. The Union Pacific Railroad personnel also play an important role in plan development. The commodity list provided gives valuable information to the NWFD planners. They will be able to identify the primary hazardous materials that are transported through the fire district. This data will already be researched, analyzed for risk, and pre-planned for operations. This will save the team valuable time and energy if an accident occurs. By implementing the technology available to the team, an effective incident action plan can be developed. The data also allows the team a method of preplanning their risk so that possible mitigation techniques can be deployed beforehand. It is also clear that members of the NWFD Special Operations Hazardous Materials team have a firm knowledge base in operations to

develop the plan. Based on the study results, the researcher can return to the problem statement that states the need for hazard specific plan development. This is now the only component lacking.

Implications of results to organization

The organization realizes the importance of effective emergency planning for specific hazards. Railway incidents were identified as a top priority risk in the Northwest Fire District's *Standards of Response Coverage* document developed for the district accreditation process (Northwest Fire District, 2006). This prompted the impetus for the research study. The district will now need to develop a procedure to create the EOP. The fire district's primary emergency operations plan contains an emergency support function for hazardous materials incidents (ESF 9) (Northwest Fire District, 2007, p. 47). It is not hazard specific. The entire document however, will serve as the primary plan for the district. A hazard specific plan should be developed more for the benefit of a safe operation to a hazardous materials incident on the railway. The implication to the district will be to create a process of developing the specific plan. In this case it will be for hazardous materials incidents. Other plans should also be developed for other major emergencies.

The Northwest Fire District has a basic Emergency Operations Plan that was developed in 2007. The district now needs to develop specific plans to deal with specific major emergencies such as railway incidents involving hazardous materials. The district should review various federal documents to ensure compliance with guidelines and regulations such as FEMA, NFPA, and OSHA agencies. They should also review the Stafford Act recommendations to ensure proper reimbursement for damages if sustained. The district should consider additions to their current emergency operations plan. The plan to develop this is part of the researcher's recommendations.

Recommendations

The results of the research study support the answer of the primary problem statement. The Northwest Fire District's Emergency Operations Plan does not address how to respond to a railway incident within their jurisdiction involving specific hazards. Developing a hazard-specific EOP will lower the risk of death or injury to responders and the public in the area of the accident. The literature review and results of the research indicate the methods available to create an effective hazard specific plan for the NWFD to follow. The primary recommendation of this research is to develop a process that addresses plan development. The process may be identified using the following procedure:

1. Establish a planning team within the NWFD including members of the NWFD Special Operations team. It is important to not only include major policy and decision-makers for the Northwest Fire District but to also include key technical experts in railway hazardous materials. Their knowledge-base will be a great asset to the plan. The senior management staff of the NWFD should have a developed network of colleagues in the community to draw upon for liaisons to the plan.
2. Review standards, regulations, and planning guides already established. Reviewing OSHA regulations ensure that a plan is developed to protect the fire district from litigation and violations. It also ensures that all measures are taken to adequately protect the safety of the responders and public. Standards of the NFPA need to be followed to ensure responders receive the proper training in Hazardous Materials (NFPA 472) and that the management of the incident is conducted in a safe and effective method (ICS procedures). The *FEMA Community Planning Guide 101* can act as a template for the district to follow for plan development. This includes procedures of the plan that will allow the district to recoup their expenses through the Stafford Act if an incident qualifies.

3. Review Emergency Operations Plans (EOP's) from other fire service agencies. This exercise will allow the planning team to possibly use materials and ideas from other agencies that might be useful to the plan. A review of the Union Pacific's plan will also be helpful. Members of their emergency response team may also be helpful in the plan development.
4. Review the current NWFD Emergency Operations Plan. A hazard specific plan will be an annex to the original plan. The review will allow planners to familiarize themselves with what has already been accomplished. They can also use the process to update any new information received since the last publication.
5. Using supplied data and new data, conduct a threat assessment of the cargo transported by rail through the district. Members of the planning team should study the Union Pacific's commodities list to evaluate the properties of the chemicals that are transported through the district. They can then preplan some of the possible incidents that may occur. They can also preplan the fixed locations along the railway route where stops occur and deliveries are made.
6. Consider a mitigation process to minimize the risk of accidents to the responders and the public. The fire

district has little control over how chemicals are transported by the railroad. The district and the community may have a say how the rail route is constructed. Railway road crossings can be elevated to eliminate possible accidents with motor vehicles. Railroad spurs and delivery points can be studied for water supply and access issues that can reduce damage should an accident occur. The terrain adjacent to the rail route can be graded to contain any spills that may occur to protect the environment.

7. Develop a hazard specific emergency operations plan that addresses the top ten hazardous commodities that are transported through the fire district. Develop a specific plan for many of the commodities transported. Using the technology and knowledge-base of the NWFD Special Operations team, conduct the "pre-research" process that Haz Mat team's use when accessing incidents. Using the CAMEO application, create the scenarios along the railway to access population densities for evacuation purposes if necessary. Input as much information as possible into "pre-incident action plan".
8. Develop training exercises that test the merits of the plan. Incorporate all stakeholders to become involved in

the training. Consult with railroad officials to verify that the operations plan meets their objectives. Conduct training sessions with all stakeholders including table-top exercises, deployment drills, and hands-on training with special team members.

9. Evaluate the plan and make adjustments. Conduct "After Action" reports for each exercise to discuss the merits and pitfalls of the plan. Have the planning team re-evaluate their plan to meet the challenges that may be presented by the stakeholders.
10. Practice the plan on a regular basis with all stakeholders. Conduct bi-annual exercises to keep all stakeholders and participants familiar with the plan and each other. Evaluate the plan annually and revise accordingly. Keep relationships with the Union Pacific Railroad officials current.

Based on the study results and literature review, a comprehensive emergency operations plan for specific railway hazards can be developed by Northwest Fire District personnel that address a safe and effective response to a major incident. Including all community stakeholders is a vital component to the plan. Practicing the plan is just as important. All stakeholders need to understand their role in the EOP. The understanding and application of the Incident Management System will ensure an

effective management of the entire process. Adherence to the proper regulations and guidelines will protect the responders and community from violations and litigation. Proper adherence will also assist with proper reimbursement if required.

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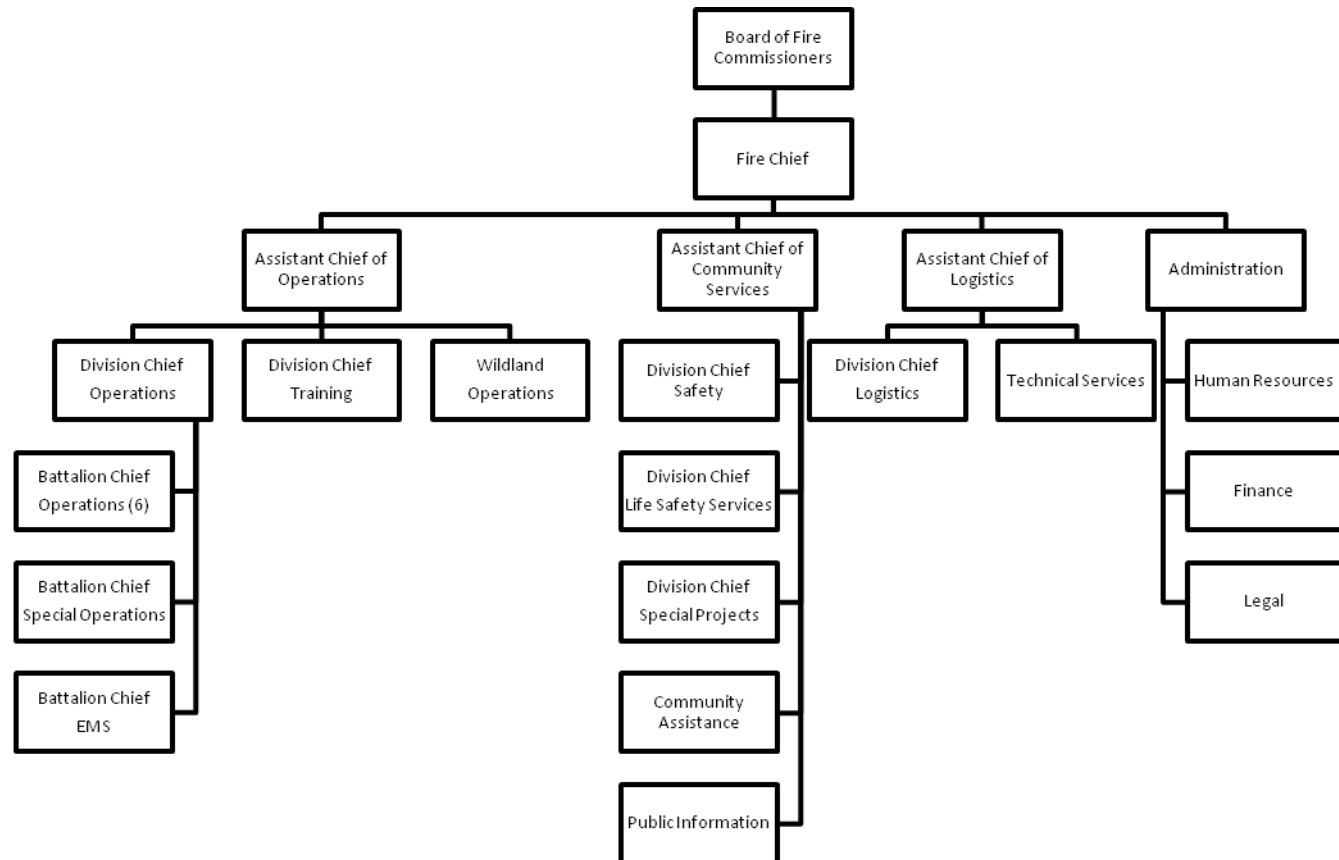
Appendix A



Figure 1: Tucson, Arizona Metropolitan Area including the Northwest Fire District

Appendix B

NORTHWEST FIRE DISTRICT ORGANIZATION CHART



Appendix C



Figure 2: Southwestern Rail routes of the Union Pacific Railroad

Appendix D

May 19, 2009

Dear EFO Students past and present;

My third year ARP deals with developing an emergency operations plan (EOP) to address railway traffic through the Northwest Fire District. As part of the research, I am looking for EOP's dealing with this criterion. One of my research questions is:

What are the criteria or standards used by other emergency services organizations with similar demographics to the Northwest Fire District using for a hazard specific railway emergency operating plan?

I would appreciate your help if you can answer the following questions:

- *Do you have a railroad running through your response area?*
- *Do you have a hazard specific railway emergency operations plan?*
- *Would you send me a copy please?*

Please supply the necessary information for proper citation.

Please submit to me by June 5, 2009.

Thanking you in advance

Bob DiPietro

Author's Note

Robert DiPietro is a Battalion Chief of Operations with the Northwest Fire District in Tucson, Arizona. He is an Executive Fire Officer candidate completing his third year at the National Fire Academy. The author is also a Deputy Fire Chief, retired from the New Britain Fire Department after over 27 years of service to the department and City of New Britain, Connecticut.

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CERTIFICATION STATEMENT

I hereby certify that this paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

X _____

Robert DiPietro